Scientific Writing (as compiled by Dr. William Staddon, EKU)

Adapted (and in some places copied) from Day, R.A. 1998. **How to write & publish a scientific paper**. Oryx Press, Phoenix, Arizona

"The best English is that which gives the sense in the fewest short words" Instructions to Authors, Journal of Bacteriology (reprinted Day, 1998)

Scientific papers clearly and concisely describe the background, methods, results and relevance of original experiments. The primary objective is to communicate research findings in an standard, understandable manner.

Paper Organization

Title

- **$** include enough detail so the reader will know what the paper is about
  $the title allows the potential reader to decide if he/she would like to read the abstract
- **$** avoid unnecessary words such as "A(n)" (at the beginning), "Observations on"
- **$** the title is ***not*** a sentence
- **$** terms in the title should relate what was actually done

Abstract

- **$** a brief summary of the paper written as a single paragraph
- **$** intended to be published on its own separate from the manuscript (e.g. as part of a collection of abstracts)
- **$** allows audience to know if they wish to read the entire paper
- **$** includes principal objectives, materials and methods, results and main conclusions
- **$** no longer than 250 words
- **$** written in past tense

Introduction

- **$** gives sufficient background to allow the reader to understand the results
- **$** define specialized terms
- **$** reviews important literature
- **$** provide rational for the experiments
- **$** specific statement of objectives
- **$** statement of principal results and conclusions

Materials and Methods

- **$** describe what was in sufficient detail that a competent colleague could reproduce the experiment and get the same results (reproducibility is the key to science)
- **$** use subheadings that match those used in the results
- **$** Do ***not*** include results

Results

- **$** state the experiment and describe the data
- **$** do ***not*** go through the materials and methods again
- **$** do ***not*** interpret the data
- **$** do ***not*** restate information found in the tables in the text; mention the highlights
- **$** do ***not*** infer what the data means

Discussion

$ explain what results mean
$ relate data to preexisting literature
$ discuss any problematic issues with the data
$ inconsistencies in the data should be discussed

Tables
$ tables should be formatted to be read down
$ words are lined up to the left
$ numbers are lined up to the right (or decimal point)
$ titles should be clear enough that the table can be understood without referring to the text -avoid using more than one clause or sentence
$ explanatory footnotes may be included for explanatory purposes such as explaining abbreviations
$ only horizontal rule lines are used
$ table numbers are assigned to reflect the order they are mentioned in the text
$ tables and figures go at the end of the manuscript
$ only one table or figure per page

Other
$ double spacing **must** be used
$ use 1" margins top, bottom, left and right
$ start each section of the paper (title page, abstract, introduction etc.) on a new page

Grammar

General
$ metaphors and similes are ***not*** used in scientific writing
$ colloquial or everyday language is ***not*** used

Bacteria were destroyed. ✘
Bacteria were killed. ✔

Along the same lines... ✘
Similarly.... ✔

$ Do not repeat the same word twice in a sentence
Bacteria with the same shape also gave the same Gram-stain reaction ✘
Bacteria with the same shape also gave an *identical* Gram-stain reaction

Proper usage of words
$ *amount* - refers a mass or aggregate; units are implied
$ *case* - use “usually” instead of “in most cases”
-use “always” instead of “in all cases”
-use “never” instead of “in no case”
$ *varying/various*
-varying means changing
-various means different and defined
$ *while/whereas*
-while is used in the context of time
I studied while I watched TV ✔
I studied while my sister played the trombone ✘
I studied whereas my sister played the trombone ✔
$ experiments do not *show*, they *illustrate*, *demonstrate*

Tense
$ previously published work written in the present tense as it is considered knowledge

-The earth moves around the sun ✔
-The earth moved around the sun ✘
-Mycobacterium tuberculosis lives in macrophages. ✔
-Mycobacterium tuberculosis lived in macrophages. ✘

$ unpublished work in not considered knowledge; therefore experiments described in the manuscript are written in past tense

-*Escherichia coli* appeared purple after gram staining (in this study)
-*Escherichia coli* appear purple after gram staining (in previous studies)

$ exceptions

-referring to results of another author

Koch (1877) proved *Bacillus anthracis* caused anthrax. ✔

-referring to a table

-Table 5 illustrates a dose-dependent effect. ✔
-Table 5 illustrated a does-dependent effect. ✘

Section of the manuscript	Tense most typically used
Abstract	past
Introduction	present
Methods and Materials	past
Results	past
Discussion	present

Single vs Plural

10 g of sodium chloride was added. (one quantity of salt was added).
Two 1 g sugar cubes were added to the coffee. (two discrete entities were added).

Numbers

$ one-digit numbers are spelled out

-"2" ✘
-"two" ✔

$ two or more digits are written as numerals

-"17" ✔
-"seventeen" ✘

$ Exception #1 - sentences do ***not*** start with numerals

-17 bacteria were characterized.
-Seventeen bacteria were characterized. ✔

$ Exception #2 - Units of measure are written as numerals

-"4 mL"

$ A problem where exceptions 1 and 2 need to be reconciled.

-4 g of sodium chloride was added. ✘
-Four grams of sodium chloride was added. ✔
-Sodium chloride (4 g) was added. ✔

Abbreviations

$ i.e. means "that is"

$ e.g. means "for example"

$ abbreviations are introduced the first time they are used in the paper

-Triple sugar iron (TSI) media were stabbed and streaked. Sulfur-indole-motility (SIM) media were stabbed only. TSI and SIM were incubated at 37^{o}C overnight.

-do **not** use abbreviations in titles
-do ***not*** abbreviate a term if it is used only a few times

Try to limit the use of
$ the

The stain was applied for 5 sec. ✘
Stain was applied for 5 sec. ✔

Common But Unacceptable Mistakes

-grammatical errors - such as incomplete sentences, improper tense
-one sentence paragraphs
-tables not placed on separate pages at the end of the document
-tables without descriptive titles
-improper table format
-incubation times and temperature not include
-short forms not written in full the first time they are mentioned in the text
-text not double spaced, tables not single spaced
-including results in the methods and materials
-including interpretations in the results
-incorrectly describing how a procedure was done

Finally

As much as I hate quoting bombastic, right-wing radio show hosts, one such personality states that "words mean things". Do your words actually say what you mean?

Journal of Immunology instructions for authors:
http://www.jimmunol.org/misc/authorfulllength.shtml

Clinical and Diagnostic Immunology instructions for authors:
http://cdli.asm.org/misc/itoa.pdf